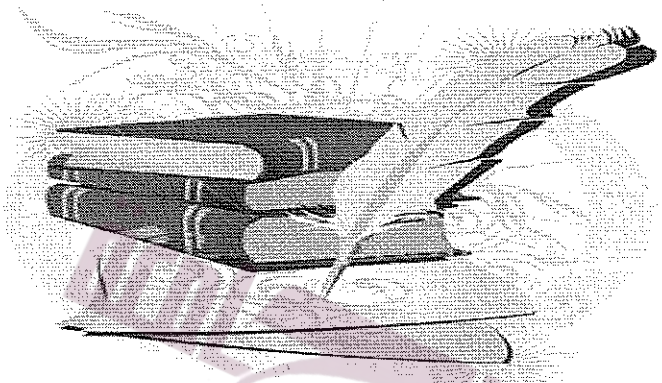
رابعة تحكم



{Real Time}

سؤال وجواب

دفعة "47" # دايما _ متجمعين

بسم الله الرحمن الرحيم

Chapter 1. Real time

1. Define.. System

answer.

① ↳ is a mapping of a set of inputs into a set of outputs.

② ↳ any component that act together to perform certain objective.

2. Define :. Servomechanism system.

answer.

is a feedback control system it's output may be position, velocity or acceleration

3. Define .. the operating system.

answer.

is a specialized collection of system programs that manage the physical resources of the computer.

4. Define.. Real time system.

answer.

is a system whose logical correctness is based on:- ① correctness of the outputs.

② time lines of the outputs.

5. Discuss the main elements of real time control systems.

answer.

(1) Software
a. operating system
b. Software application

(2) Hardware
a. CPU b. buses
c. Computer interfaces
d. ports

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6. Identify the advantage of using the computer in real time system.

answer.

① ability to make correct decision at suitable time.
② low cost
③ easy interaction between system and operator.
④ perform difficult algorithms.
⑤ small noise effect.
⑥ good maintenance.
⑦ good accuracy
⑧ graphical user interface (GUI) is available.

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7. Define hard real time system.

answer.

is a system → in which failure to meet a single deadline may lead to complete system failure.

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8. Define soft real time system.

answer.

is a system in which performance is degraded but not destroyed by failure.

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9. Define. firm real time system.

answer.

is a system in which a few missed deadlines will not lead to total failure, but missing more may lead to complete system failure.

10. Discuss the main real time tasks.

answer.

① I/p task → express i/ps that connect computer to the plant.
② o/p task → express o/ps that connect computer to the output.
③ Control task → operates on the internal image of the plant.
④ Communication task → connect computer with each other.

11. What are the classifications of RTS ?

answer.

① Clock based. يعمل خلال فترة زمنية محددة
↳ operates through specific time.
② Sensor (event) based. لديك action إلى بعد وصول إشارة
↳ depends on the reading of the Sensors. حدوث الـ event.
③ Interactive based. لا يعمل إلا بعد حدوث interaction مع
↳ depends on the user's order to carry out the orders الجهاز.

12. Which of the following is real time system?
① autopilot
② controlling DC motor by microcontroller
③ Controlling heater by PLC
④ writing simulation program for designing DC motor controller.

answer:
①, ②, ③ → Real time systems
↳ interactive with outer environment.
④ → Not Real time syst

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13. what are the main types of RTS? give examples for each type.

answer
① Type 1:- ليس له وقت محدد ولكن يتم حساب الـ average
↳ the system has an average time measured over a defined time interval.
ex:- any interactive system.
② Type 2:- يعمل خلال فترة زمنية محددة.
↳ Computation must be completed within a specified maximum time.
ex:- hot air blower

14- Compare between..
Sequential programming & multi-tasking programming & Real-time programming.

answer:

① Sequential لا يتم تنفيذ الخطوة إلا بعد تنفيذ التي تسبقها
↳ The result depends on the previous steps.

② multi-tasking ينفذ أكثر من خطوة في نفس الوقت
↳ Carry out more ويعتمد على البدء وليس ترتيب الخطوات than one job in the same moment and doesn't depend on the arrangement of steps

③ Real-time .Real time مصنوعة خصيصًا للتعامل مع أنظمة
↳ can deal with I/o ports and it's interactive with outer environment.

تم بحمد الله

بسم الله الرحمن الرحيم

Chapter 2 _ Real time

1. Compare between embeded systems and general purpose computers.

answer.

. An embeded computer is implemented for particular purpose.

. general purpose computer (Pc) serves a number of purposes.

2. Define embeded computer.

answer.

is a Computer that's implemented for a particular purpose only have a single task or very small number of related tasks that they are programmed to perform.

3. What are the main characteristics of embeded systems?

answer.

① Completely or partially independent of human intervention.
② Perform a few tasks in the most efficient way.
③ Interacts with physical elements in our enviironment.

4. What are the advantages of using embeded system ?

answer.

① Compact size — صغير الحجم
② economical — أقل تكلفة
③ virtually limitless in industry. — أتاح استخدام التكنولوجيا في الصناعة

5- What are the main disadvantages of embeded systems ?
answer.

① The embeded system must hasn't any error during the production. "لابد سرعاة عدم وجود أخطاء في المنظومة"
② need for expert engineer to perform the maintenance

6- Explain why embeded systems are time critical applications.
answer.

The embeded system is working in an enviroment where timing is very important and the result of an operation are only relevant if they take place in a specific time frame.

7- What are the main categories of industrial process ?
answer.

① Batch systems المنظومة التي تتم بنيا العملية الصناعية على مراحل
مثل: rolling of sheet steel
↳ used to describe the sequence of operation which is carried out to produce a final product
② Continous systems المنظومة التي تعمل لفترة طويلة تصل إلى سنين
↳ used to describe systems in which the production process takes a long time may be months or years.
قد يوجد بداخلها عليات batches.
مثل.. Petrol Process
③ Laboratory (test) process المنظومة التي تنبأ قياسات واختبارات
↳ it's the process in which the computer is used to control some complex experimental test

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8- What are the main activities of computer in real-time?

answer.

1. Sequence control
2. Loop control (DDC) → Direct discrete control
3. Supervisory control
4. data acquisition
5. data analysis
6. man-machine interface

9- Compare between DDC and analog control based on: the cost & the performance

answer.

cost → ① DDC is cheaper than analog unit.

performance → ② DDC use improved control algorithms.

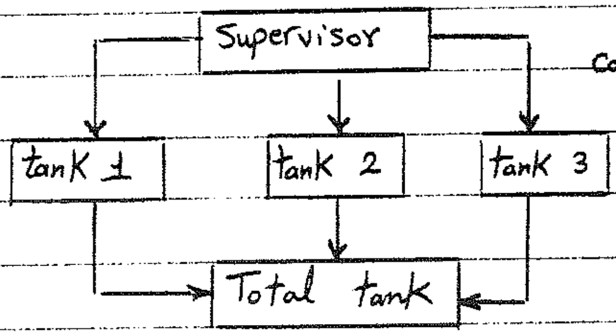
③ DDC improves the accuracy of the controller.

④ DDC provides a wider range of control setting.

10- Give an example to explain the operation of supervisory control.

answer.

It provides management and coordination between sub-systems contained to provide comprehensive picture of the states of the plant operations.



كل tank له controller خاص بيه وفي controller للمنظومة ككل.

11. Show the difference of using MMI for.
operator - engineer - manager.

answer:

① Operator
↳ provided with a simple and clear system for the day-to-day operation of the plant.
↳ All the information relevant to the current state of operation should be facilitates, to enable interaction with the plant.

② engineer
↳ determines the exact nature of the displays for the plant or part of the plant.

③ manager
↳ requires access to different information
↳ assessing the economic performance of the plant
↳ determining possible improvements in plant operation.

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12. Write about the role of control engineering in the field of the real control system.

answer:

① define measurements and actuations.
② define DDC controllers
③ tune the control scheme
④ define and program the sequence control procedures necessary for the automation of plant operation.
⑤ determine and implement satisfactory supervisory control schemes.

13- Show how the multicomputer can be used and coordinated in industry.

answer-

1- Hierarchical هرمية سرأ سفل لأعلى
   ↳ divided according to function
2- Distributed يتم تقسيم العمليات بها
   ↳ perform essentially similiar tasks in parallel.

14- Compare between centralized and decentralized control system.

answer.

Decentralized	Centralized
↳ individual computer to every process.	↳ any failure lead to complete shut down.
↳ any failure doesn't lead to complete failure	↳ only one computer is used to control all tasks.
↳ available maintenance for any part individually	↳ hardware is complex.

15- What are the main assumptions of the distributed approach?

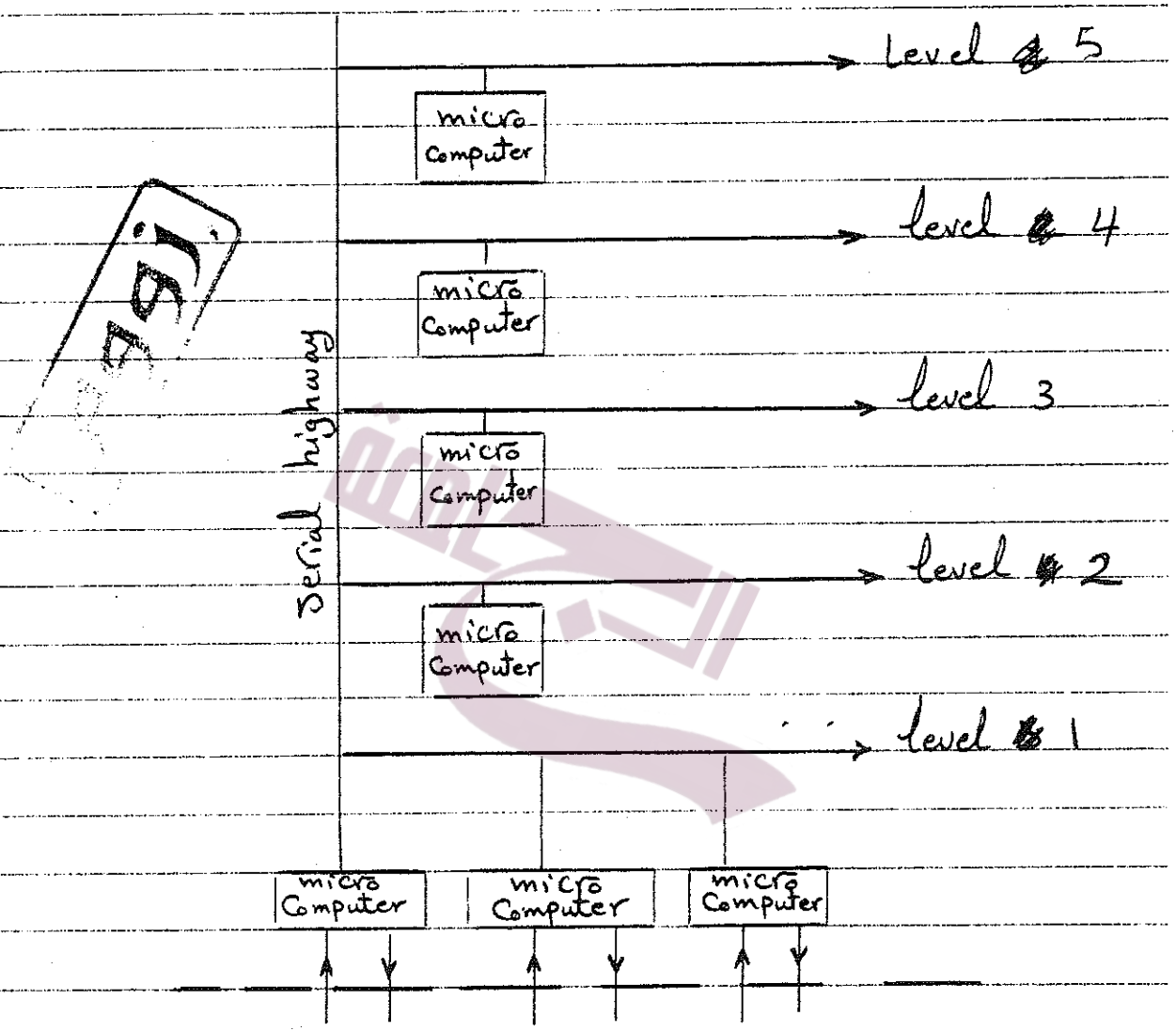
answer.

① each unit is carrying out essentially similar tasks to all the other units.

② In the event of failure or overloading of a particular unit all or some of the work can be transferred to other units.

16- What are the main Levels of distributed & heirical systems ?

answer:



level 1 → measurement / actuation
level 2 → DDC
level 3 → Sequence control
level 4 → Operator
level 5 → Supervisory control

17. What major advantages of using distributed & hierarchical systems?

answer.

(1) The system capabilities are greatly enhanced by the sharing of tasks between processors.

(2) The system is much more flexible than the use of single processor.

(3) Failure of unit will cause much less disruption in that only a small portion of the overall system will not be working.

(4) easier to make changes to the system.

(5) Computer units can be widely dispersed.

بسم الله الرحمن الرحيم

Chapter 3 -- Real time

1- What are the main portions of DOS operating system?

Sol.

There are three major portions (components)

① DOS_BIOS :-

* stored in a system file, and appears under names (IBMBIO.COM, IBMIO.SYS or IO.SYS).
* contains the device drivers for the keyboard, display, printer, serial interfaces, real time clock and floppy and hard disk drives.
* is the most hardware dependent component of the operating system.

② DOS_Kernel :-

* normally invisible to the user in IBMDOS.COM or MSDOS.SYS
* contains file access routines.
* use the device drivers of DOS_BIOS for keyboard, display, printer, hard disk, serial interface and real time clock.
* Application programs can access the Kernel Functions.

③ Command processor :-

* It's contained in the DOS file COMMAND.COM
* The command processor displays the command prompt (C:\>) on the screen.

مكونات نظام التشغيل الرئيسية:
① 16 bit operating system
② DOS commands:
a- internal
b- external
c- batch files

* accepts input from the user and controls input execution.
* Consists of three modules...

→ ⓐ The resident portion...
* the part that remains in memory, contains various routines called critical error handlers which allow the computer to react to different events.

→ ⓑ The transient portion...
* contains code for displaying the prompt, reading user input from the Keyboard and executing input.

→ ⓒ The initialization portion...
* loads during the booting process and initializes DOS

---

2. What are the main advantages of microsoft windows?

Sol.
① multitasking support.
② graphical user interface for all applications.
③ improve the speed of communication between people and computers.
④ virtual memory management.
⑤ Dynamic data exchange.
⑥ Application programs that are independent of system devices.

→ DOS internal commands :- contained in the resident portion of the command processor (DIR, COPY and RENAME)

→ DOS external commands :- must be loaded into memory from diskette or hard disk (FORMAT and CHKDSK)

→ Batch files: are text files containing series of DOS Commands (AUTOEXEC.BAT)

3- Discuss the limitations of using microsoft windows in real time control system.

Sol.

1. Don't consider the peripherals as high priority.
2. Data acquisition:

It's the timing which can't be guaranteed when using the operating system which means that it can't be used when timing is critical.

4- What's the main characteristics of unix operating system?

Sol.

* is a powerful multi-user and multitasking operating system.
* is similar to the DOS command processor.
* All hardware and software objects are treated as files.

5- Define real time operating system.

Sol.

→ is a multitasking operating system intended for real time applications.

→ is an operating system in which the maximum time from an input stimulus to an output response can be definitely determined.

→ An embeded operating system :-

* is an operating system for embeded computer systems.
* Very Compact and efficient.

6- Compare between DOS. unix. windows - RTOS based on real time control applications.

Sol

→ DOS :-

① Single user ② single task
③ No graphical user interface.

⇝ used in real time applications but not preferred.

→ Unix :-

① multiuser ② multitasking
③ high priority ④ expensive

⇝ used in real time applications.

→ Windows :-

① multitasking
② No priority for certain job

⇝ not used in real time control systems.

→ RTOS

5. تكتب إجابة السؤال وقت

تم بحمد الله

بسم الله الرحمن الرحيم

Chapter 4 _ Real time

1. What are the hardware requirements to realize real time control system ?

Sol.

① modular ② Not include hard disk
③ Support for peripheral instrument.
④ Support for communications.
⑤ Robust for vibration and magnetic field.
⑥ Support for real time.
⑦ Communicate with operator, sensor and industrial instrument.

2. Why general purpose PC is be difficult to be used in industry ?

Sol.

① Normal cooling system.
② Not ideal case for real time control system.
③ use hard disk which suffer from vibration, dust and magnetic fields.
④ Not integrated of operating system.
⑤ Not integrated for industrial process.
⑥ it affected badly by:- ① vibration
② high temperature ③ magnetic fidd
④ electric fidd.
⑦ Doesn't have all Kinds of interface

3- What's the ruggedized industrial PC ?

Sol.

① Support for peripheral instrument.
② Pressurized cooling system.
③ multi-tasking and deal with I/o ports.
④ Support for communication.
⑤ Ideal case for Real time control system.
⑥ Can be used in harsh environments.
⑦ Not used Hard-Disk but use RAM, SRAM.
⑧ Integrate for operating system.
⑨ modular.
⑩ Integrated for industrial process.
⑪ Antivibration shock and immune to interference with magnetic and electric fields.

4- Compare between general purpose PC and industrial PC.

Sol.

إجابة السؤالين رقم 2، 3

5- What are the important features of CPU that be used in Real time ?

Sol

① Flexible addressing modes for direct and immediate addressing.
② Relative addressing modes (direct-indirect-intermediate)
③ address modification by use of index registers.
④ Single commands to carry out multiple operations.
⑤ Instructions to transfer variable length blocks of data between storage units or locations within memory.
⑥ word length.

⑦ Number of general purpose registers.
⑧ Information transfer rate.
⑨ Interrupt structure.
⑩ Transfer data rate

6- What are the important features of storage in Real-time system?

Sol.

→ it divides into two main categories..

① Fast access storage → the part of the system which contains data, programs and results.
ex.. RAM & ROM

② Auxiliary storage → the main problem is the limited speed.
ex.. Hard disk, CD and Floppy disk

7- What are the features of input/output and bus structure?

Sol.

→ Input/output .. is one of the most complex areas of computer system because of the wide variety of devices which have to be connected and the wide variations in the rates of data transfer. and it can be divided into

① Process I/o ② Operator I/o
③ Computer I/o

→ Bus.. is a collection of conductors which carry electrical signals. and it can be divided into..

① Address lines → provide information on where the information is to be sent.
② Data lines → show what the information is
③ Control lines → indicate when it is to be sent and status

8- What are the types of interfacing ?

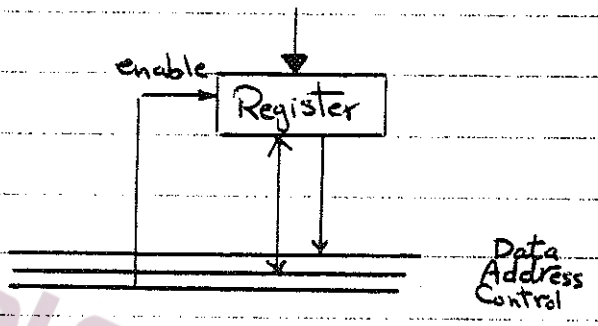
Sol.

① Digital interface (0, 1)

ex:- Valve open or closed

Relay - transistor
Encoder - limit switch
Push button

* The output of digital interface are logic signal that will appear on the digital input register.



② Analog Interface

ex:- ADC & DAC

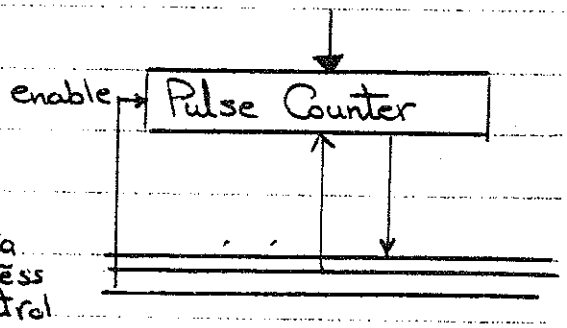
* this type has two main operations:-

① Sampling ② Quantization

③ Pulse interface

* Consists of a counter connected to a line from the plant and this counter will reset after a fixed length of time under program control

ex:- flowmeter - stepper motor



④ Telemetry interface

- Transmits data over very long distances using SCADA or DCS.

9- Explain the effect of Real time clock for the performance of real time.

Sol.

- A real time clock is a vital auxiliary device for control computer systems.
- when we choose it very small interval (high precision), the CPU will spend a large time to serve the clock and will not able to perform any other work.
- Real time clock can be read from external card with battery (if the mains power failed, the program will not be lost).

10- What are the types of interfacing data transfer?

صيغة أخرى ← Compare between Polling and interrupts for data transfer.

Sol.

① Polling :-

→ looping at the port until reading the data

Advantages :- → No hardware requirements.

→ No software requirements.

Disadvantages :- → Data may be lost.

→ Time consuming.

② Interrupt :-

→ The program flow can be temporarily stopped to allow the interrupts to run and then the main program will be resumed.

Advantages :- → Interrupt is interactive with event.

→ execute the command according to priority.

→ No time consuming.

Disadvantage :- → to use the interrupt, the hardware and software must have this facility.

11- Why interrupts are essential for real time control system ?

Sol.

① provide the solution to the conditional wait program.
② essential for correction operation of most computer systems.

12- What are the applications of the interrupt ?

Sol.

① Real time clock
② Alarm inputs
③ Manual override
④ Debugging aids
⑤ hardware failure
⑥ Operating systems
⑦ Power failure

13- Compare between PC, ISA, EISA, PCI cards.

Solution.

طالبتجي في الاختياري بيبقى
بيسأل عن Data

Bus Card	Data (Bits)	Address (Bits)
PC	8	20
ISA	16	24
EISA	32	32
PCI	64	32

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* حل الأكل والاختياري ..

① The data transfer techniques are :-
→ ① Polling ② Interrupts

② Some of standard interfacing cards are :-
→ ① PC ② ISA ③ EISA ④ PCI

③ Serial communication techniques can be characterized in several ways :-
→ ① mode ② quantity ③ Distance ④ Code

④ The main features of the basic instruction set of the CPU are :-
→ ① single commands to carry out multiple operations.
② Address modification by use of index registers.
③ Single commands to carry out multiple operations.

⑤ The main features of RTOS are :- جاب ثالث Ch 3
→ ① graphical user interface
② multitasking ③ virtual memory

⑥ For interfacing stepper motor with PC
→ Pulses interface is used.

⑦ For interfacing strain gage with PC
→ Analog interface is used.

⑧ The important feature of the CPU which determines the processing power for process control are :-
→ Interrupt structure, information transfer rate.

⑨ A valve is opened or closed can be interfaced with PC using :-
→ Digital interface

⑩ For real time control system, one of the hardware requirements is :-
→ Instruction set - word length

(11) For data transfer techniques, it's better to use..
→ Interrupts

(12) The word length is important in
→ Ensuring adequate precision in calculation.

(13) Data bus local area network is..
→ simple

(14) A characteristic of computers used in control system is they are..
→ modular

Ch 3 بابتالع (15) One of the specifications of the real time operating system..
→ Direct access external hardware.

(16) word length..
→ is hardware requirement

(17) Asynchronous transmission..
→ implies that both the transmitter and receiver circuits use their own local clock signals.

(18) The better interfacing card is..
→ PCI

(19) In data bus computer network..
→ All the devices are plugged into the transmitting medium.

→ Compare between Serial and Parallel data transfer.

[1] Parallel

→ Fast transmission speed.

→ high cost

→ need complex hardware.

→ limited for long distance.

[2] Serial

↳ Distance _ Code _ Mode _ Quantity

Distance: local, wide

Code: ASCII, other Code

Mode: synch., Asynch.

Quantity: block, character by character